September 1982

Technical Report 32

THE SAVING-INVESTMENT APPROACH TO THE CURRENT ACCOUNT

by

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The views expressed in this study are those of the author and no responsibility for them should be attributed to the Bank of Canada.

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This report was written while he was employed as a research consultant in the International Department at the Bank of Canada during the summer of 1981. He wishes to thank David Longworth and Kevin Clinton at the Bank for helpful comments and suggestions.

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ABSTRACT

This report summarizes the results of an investigation of the potential usefulness of focusing on the gap between national saving and investment when analyzing the current account. From a theoretical viewpoint, the conclusion is that such an approach for short-run analysis is likely to be extremely misleading because it does not give sufficient emphasis to the income determination process over the course of the business cycle. For intermediate and long-run analyses, economic theory suggests the importance of interest rate effects on saving and investment and the stock-flow interactions between the capital stock and capital investment and between wealth and saving.

Notwithstanding these theoretical considerations, the attempt to isolate statistically significant interest rate and stock accumulation effects in aggregate saving and investment equations was quite unrewarding. It appears that the saving-investment approach can provide little assistance in improving forecasts of the current account over the short run. In part this result may be due to the quality of data series available on financial wealth and capital stock variables. In part it may reflect a need to apply more sophisticated theories of consumption and investment behaviour based on intertemporal optimization. For example, it may be necessary to distinguish between permanent and temporary income and to allow explicitly for interest rate shocks in order to relate current account movements to saving and investment in a satisfactory manner.

Of course, one may still want to impose theoretical properties suggested by the approach in intermediate-run models. It is my view, however, that model builders will have to be willing to impose a large amount of a priori theoretical knowledge to obtain satisfactory results for estimated coefficients.

RÉSUMÉ

Dans ce rapport, l'auteur présente les résultats d'une étude visant à déterminer s'il y a lieu de centrer l'analyse du compte courant sur l'écart qui existe entre l'épargne et l'investissement. Cette approche est en principe extrêmement dangereuse si elle est utilisée dans le cadre d'une analyse à court terme, car elle n'accorde pas une importance suffisante au processus de détermination du revenu dans le déroulement d'un cycle économique. En ce qui concerne les analyses à moyen ou à long terme, la théorie économique semble reconnaître que les taux d'intérêt ont une influence importante sur l'épargne et sur l'investissement et qu'il existe des interactions entre, d'une part, le stock de capital fixe et l'investissement et, d'autre part, le stock de richesse et l'épargne.

Malgré le bien-fondé de ces considérations d'ordre théorique, l'analyse statistique n'a pas permis de démontrer que les taux d'intérêt et les stocks de richesse et de capital avaient une incidence significative sur l'épargne globale et l'investissement. Il ne semble pas qu'une méthode d'analyse axée sur l'épargne et l'investissement puisse vraiment aider à formuler des prévisions à court terme sur l'évolution du compte courant. Cela pourrait s'expliquer en partie par la qualité douteuse des statistiques relatives au patrimoine financier et au stock de capital. Il est possible aussi que cela soit dû en partie à la nécessité de recourir à des théories plus rigoureuses du comportement du consommateur et de l'investisseur, fondées sur une optimisation intertemporelle. Il peut être nécessaire, par exemple, de distinguer entre le revenu permanent et le revenu transitoire et de tenir expressément compte des chocs du taux d'intérêt afin d'établir un rapport satisfaisant entre les variations du compte courant et celles de l'épargne et de l'investissement.

Évidemment, il se peut qu'on veuille encore retenir les propriétés théoriques qu'implique cette approche pour l'analyse à moyen terme. Toutefois, l'auteur est d'avis que dans ce cas les constructeurs de modèles devront être prêts à imposer un grand nombre de restrictions a priori s'ils veulent obtenir des estimations satisfaisantes des coefficients.

1 INTRODUCTION

Why do some countries run persistent current account deficits while others have equally persistent surpluses? In answering this and other questions about movements in current account balances, builders of econometric models typically focus on export and import supply and demand functions directly, making due allowance for simultaneous determination of national income within a macroeconomic framework. In such a Keynesian framework, movements in the current account are found to depend strongly and negatively on changes in national income via the marginal propensity to import and, with less certainty and predictability, on changes in relative prices. Despite the short-run dependence of the current account on income, however, the forces that bring about long-run current account equilibrium may well arise from sources other than adjustment in national income.

Thus, although the Keynesian approach works quite well for explaining short-run cyclical movements in the current account, it is less satisfactory for explaining longer-run trends such as Germany's persistent balance of payments surpluses prior to the first oil shock (cf. Kindleberger [1976]) or U.S. current account surpluses during the post-World War II period. Furthermore, it provides no indication as to the sustainability of current account imbalances, nor does it describe possible equilibrating tendencies that tend to bring about a zero balance gradually over time.[1]

For analyzing intermediate and long-term problems, therefore, economists have sometimes taken a different perspective, called the saving-investment (S-I) approach to the current account or, equivalently, the saving-investment approach to "net foreign investment" or "long-term capital flows" (see Feldstein and Horioka [1980]). This approach focuses on the national income accounting identity that relates net exports of goods and services to the gap between national saving (private and public) and domestic investment. The theory is that the level of the current account can be "explained", and at least its long-term trend predicted, by analyzing the behaviour of saving and investment in the domestic economy. In some cases (e.g., McKinnon [1980])

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1. Salop and Spitäller [1980] provide a detailed discussion of the sustainability and optimality of current account imbalances.

even short-term current account movements have been attributed to changes in saving and investment, particularly to changes in net saving by the government sector.

The paper proceeds as follows. Section 2 considers the application of the saving-investment approach in short-run macro models. Long-run trends of the current account in theoretical models are discussed in Section 3. The empirical applicability of the saving-investment approach for Canada is examined in the final section.

2 SHORT-RUN APPLICATION OF THE SAVING-INVESTMENT APPROACH

Before turning to the use of the saving-investment approach for long-run analysis, we will briefly discuss its use for analyzing short-run cyclical behaviour. Any such analysis must incorporate some theory of income determination to explain deviations of output from its full-employment potential. Accordingly, we consider two simple fix-price specifications which provide some interesting contrasts, one a Keynesian and the other a classical unemployment model.

A Keynesian Model

In a typical Keynesian model, the short-run level of output is determined by aggregate demand. This requires that foreign demand for domestic output be less than infinitely elastic at prevailing prices; that is, the country under consideration is not a "price taker" in the world market for domestic export goods. (Otherwise aggregate demand would be unlimited and full employment would prevail.) Using standard notation, the equilibrium level of output is:

$$Y = C(Y) + I + G + X - M(Y) \quad . \tag{1}$$

Given the equilibrium level of national income, the current account[2] is easily determined:

$$CA = X - M(Y) \quad . \tag{2}$$

It is, of course, true that (1) can be rewritten using the definition of national saving:

$$S \equiv Y - C(Y) - G \tag{3}$$

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2. Initially, international interest payments and other service account transactions are ignored, so that the current account can be considered equal to the balance of trade.

in the form:

$$CA \equiv X - M(Y) = S(Y) - I \quad . \tag{4}$$

Therefore, ex ante saving minus investment equals the current account when the equilibrium level of income, from equation (1) or equivalently (4), is used to determine saving. It is not correct to use the saving-investment specification that:

$$CA = S(Y) - I \tag{5}$$

without explicit consideration of the income determination process. The same dictum applies to the absorption approach, which states that the current account equals the gap between national output and absorption:

$$\begin{aligned} CA &= Y - [C(Y) + G + I] \\ &= Y - A(Y) \quad . \end{aligned} \tag{6}$$

Again this specification only becomes meaningful after inserting the equilibrium level of income.[3] Equation (2) on the other hand is true for any level of income.

Failure to appreciate this distinction can lead to some apparently paradoxical results. According to Keynesian models, which typically state the current account directly as the difference between exports and imports, an increase in income worsens the current account because of a positive marginal propensity to import. In contrast, the saving-investment approach (based on equation (5)) and the absorption approach (based on (6)) suggest that an

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3. If income adjusts only gradually to its Keynesian equilibrium level via a partial adjustment process, for example:

$$\dot{Y} = \lambda[C(Y) + I + G + X - M(Y) - Y] \ ,$$

it is incorrect to use (4) as a specification of the current account. Equation (3) remains appropriate whether or not income is in equilibrium.

increase in income should improve the current account, either by increasing saving relative to investment or by raising absorption less than the rise in income. The apparent contradiction between the Keynesian and saving-investment approaches arises because of a failure to recognize the endogeneity of income. Obviously, it is not legitimate to analyze the comparative static effects of changes in one endogenous variable on other endogenous variables. Rather, one needs to know what exogenous shock or policy change causes income to rise before the impact on the external accounts can be assessed. Once this cause is determined, it will make no difference in Keynesian models of income determination whether the trade balance is perceived as the saving-investment gap or more straightforwardly as exports minus imports. This fact is not always recognized. For instance, McKinnon [1980, p. 237], emphasizing the supposed superiority of the S-I approach (which he refers to as the absorption or income-expenditure approach) for understanding the Japanese-American trade imbalance during 1977-78, states:

> Two further aspects of this income-expenditure approach to the Japanese-American trade balance are important to note. First, 'unfair' Japanese trade practices are not responsible. For example, removing high barriers on agricultural imports into Japan would simply alter the composition of Japanese imports without much affecting the net surplus. A similar rationalization of American energy policy would probably reduce imports of fossil fuels into the United States, but would be offset elsewhere as long as America is deficient in saving. The microeconomic details of trade in this or that commodity are dominated by broad investment-saving considerations--unlike current heated political discussions of these issues would suggest.

The presumption here--that the trade balance will be little affected by policy-induced relative price changes or other "microeconomic details of trade" because they have little effect on either the saving rate or investment--is misleading. What the author ignores is the endogeneity of income, in particular its responsiveness to the increased expenditure on domestic goods that can be brought about by various expenditure-switching policies. In a Keynesian model, tariff reductions that reduced aggregate demand for Japanese goods, by inducing substitution towards competitive foreign products, would reduce Japanese GNP with the usual multiplier effect

if the Marshall-Lerner condition were satisfied. This would cause saving to fall relative to the unchanged level of investment and, according to the saving-investment approach, this result would worsen the current account. The same conclusion is obtained from the Keynesian approach: the tariff-induced substitution effect, which increases imports, more than offsets the reduction in import demand due to the fall in output. Regardless of which approach is employed, it is essential that the effect of tariff reduction on equilibrium output be obtained. Failure to explicitly account for the equilibrium determination of income can lead to analytical errors and incorrect conclusions about the unresponsiveness of the trade balance to policies that alter relative prices.

A Classical Unemployment Model

A second specification of short-run income determination is based on the "small country" model where the world demand for a country's exports is assumed to be infinite at the prevailing world price p^*. In this case unemployment and excess capacity may occur if nominal wages are inflexible. If wages w are fixed too high relative to output prices in terms of domestic currency ep^*, the profit-maximizing level of output chosen by competitive firms will fall short of the full employment level. The resulting unemployment is "classical" in that it is caused by excessive real wages rather than by a deficiency in aggregate demand. This specification provides a useful contrast to the simple Keynesian model in that output is determined completely on the supply side given the prevailing constellation of wages, prices and the exchange rate. (See Cuddington [1980, 1981] for a detailed treatment of fix-price equilibrium models.)

The saving-investment and absorption approaches provide the most straightforward specification of the trade balance for the small open economy. In the classical unemployment model, the profit-maximizing level of output depends on the real wage:

$$Y = Y(w/ep^*) \quad . \tag{7}$$

Therefore, the usual equilibrium condition:

$$Y = C(Y) + G + I + X - M(Y) \tag{8}$$

now determines the level of exports that will be supplied to the world market. It does not determine the level of GNP as it did in the Keynesian framework, where X was the fixed level of export demand and output was demand-determined.

When classical unemployment arises from wage rigidity, Y is determined by the profit-maximizing decisions of firms reflected in (7). Consequently equation (8) would be more revealing if rewritten as:

$$X^S = Y - C(Y) - G - I + M(Y) \tag{9}$$

to emphasize that it is implicitly the export supply function. Substituting X^S into the balance of trade equation yields:

$$CA = X^S - M \tag{10}$$

$$CA = Y(w/P) - C(Y(w/P)) - I \tag{11}$$

$$CA = S(Y(w/p)) - I \ . \tag{12}$$

Equations (11) and (12) are the specifications of the absorption and saving-investment approaches respectively.

A rise in income--caused by technological change, a rise in the world price of exportables, exchange rate depreciation, or a fall in domestic wages--will increase saving, thereby bringing about an improvement in the trade balance. For the Keynesian unemployment environment, we reached exactly the opposite conclusion.

It should be noted that in classical unemployment situations fiscal expansion has no effect on GNP. By increasing aggregate demand it merely reduces the supply of output available for export after meeting domestic demand (at prevailing prices). Put differently, total domestic (private plus

public) saving falls when government spending is increased if the latter is not tax-financed. Consequently, the current account deteriorates.

In summary, both the saving-investment approach and the standard specification of the current account as the difference between the value of exports and imports yield identical conclusions, provided the analysis is explicit about the income determination process being assumed, and provided income is in equilibrium in the sense that equation (8) holds. Otherwise, logical errors may creep in when exogenous shocks have direct effects on the export, import, saving or investment functions as well as indirect effects through changes in equilibrium output. The foregoing discussion illustrates this point by considering two quite different models, which can be used to isolate the differing effects of aggregate demand and supply shocks respectively on output and the current account. Whether the correlation between movements in output and the current account is positive or negative cannot be determined a priori; explicit consideration of the income determination process is essential.

3 LONG-RUN TRENDS IN THE CURRENT ACCOUNT

Several theoretical papers, including the seminal one by Metzler [1963] and a critical review of it by Holmes [1973], have used the saving-investment specification of the current account in simple full-employment models. Rather than concentrating on income adjustment, they emphasize the role of interest rates in equating positive net saving (i.e., saving minus investment) in one country and negative net saving in the rest of the world. In the long-run context cyclical deviations from full employment can be ignored; the current account is seen to depend positively on the interest rate:

$$CA = S(r,Y_f) - I(r) \tag{13}$$

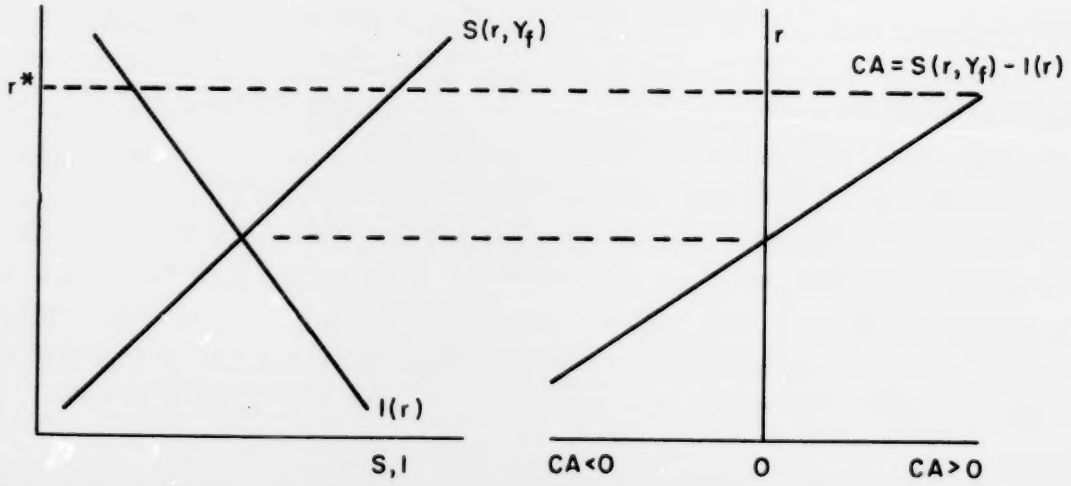
where the interest rate adjusts to equate world saving and investment:

$$S(r,Y_f) - I(r) = I^*(r) - S^*(r,Y^*_f) \quad . \tag{14}$$

This simple model is shown in Figure 1 for the small country case, where r is assumed to be fixed at the world level r^*, obviating the need to incorporate financial considerations into the following analysis.

Figure 1

CURRENT ACCOUNT DETERMINATION IN THE LONG RUN



The model has been used by Salop and Spitäller [1980] to argue that the sustainability and optimality of current account imbalances ultimately depend on the sustainability and optimality of the underlying domestic consumption/saving behaviour. An efficient allocation of total world saving among all investment opportunities regardless of geographic location is assumed. The same model also forms the basis for von Furstenberg's [1980] empirical study of U.S. net foreign investment.

Two considerations that have not been taken into account in the model are discussed in the following subsections: the role for relative prices in the determination of the long-run current account, and the fact that the current account can apparently remain nonzero indefinitely.

The Role of Relative Prices

In our earlier discussion of situations where foreign export demand is less than perfectly price elastic, we used a Keynesian specification of short-run income determination:

$$Y - C(r^*,Y) - I(r^*) = X(e_o) - e_o M(e_o,r^*,Y) \tag{15}$$

which can be rewritten as:

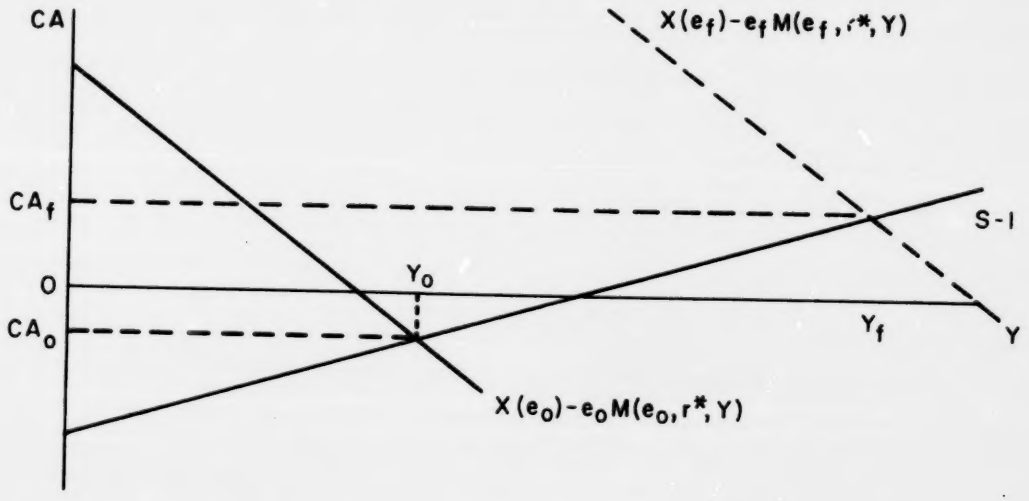
$$S(r^*,Y) - I(r^*) = X(e_o) - e_o M(e_o,r^*,Y) \quad . \tag{16}$$

The term e_o is the initial real exchange rate and represents the relative price of imports in terms of exports; M denotes the quantity of imports. It does not matter for present purposes whether the nominal exchange rate is market-determined or fixed by the monetary authority.

By graphing the functions on the left- and right-hand sides of the equality sign in equation (16), the short-run equilibrium level of income Y_o at the prevailing real exchange rate is easily determined, as shown in Figure 2. In contrast, the long-run current account is the level CA_f that corresponds to full-employment income Y_f, where imports are much larger than at Y_o. To equate net saving and net exports at this level, exports would

Figure 2

SHORT-RUN VS. LONG-RUN EQUILIBRIUM OF INCOME



have to be much higher than the initial level $X(e_0)$, given in (15) and Figure 2. Assuming the Marshall-Lerner condition is satisfied (at least in the long run, which is relevant when analyzing a full-employment steady state), the relative price of exports must be allowed to fall until X has risen to the level consistent with $Y = Y_f$. It can no longer be considered exogenous as it was in the short-run Keynesian model. The required relative price change shifts the X-M locus in Figure 2 so that it intersects the S-I locus at the full-employment income level.

It is usually assumed that levels of saving and investment do not depend significantly on relative prices. Thus, price adjustments that restored full employment would have little effect on the level of the long-run current account; only its composition would be affected. On the other hand, Laursen and Metzler [1950] claim that real saving as a fraction of income should theoretically depend positively on the terms of trade (i.e., negatively on the real exchange rate). Diagrammatically this means that the S-I locus in Figure 2 would shift upwards and to the left as the relative price of exports fell as required to move the X-M locus rightward to the full employment income level. Provided the Laursen-Metzler effect and any terms-of-trade

effect on investments are small, it is reasonable to assume that the long-run level of the current account is independent of the relative price changes required to attain the full employment level of output. This suggests that while the inclusion of relative price terms in empirical applications of the S-I approach may be useful in determining short-run income (via the export and import equations), it will probably not significantly affect the long-run level of the current account.

Current Account Imbalance

There is nothing in the full-employment specification of the current account as discussed above that ensures that the current account tends towards zero over time. In a no-growth context, however, several authors (e.g., Dornbusch [1975], Frenkel and Rodriguez [1975]) have examined the interaction between current account imbalances and wealth accumulation and thus provided a characterization of the "international adjustment process" whereby external imbalance is eliminated. These models emphasize portfolio balance, especially the interaction between stocks and flows, where saving augments national wealth thereby increasing domestic consumption expenditure, and investment augments the capital stock and hence output capacity. To capture the stock-flow interactions, we write:

$$S = S(r^*, Y, W), \quad \partial S/\partial Y > 0 \ , \quad \partial S/\partial W < 0 \ , \tag{17}$$

$$I = I(r^*, K) \ , \quad \partial I/\partial K < 0 \ , \tag{18}$$

where K and W are the domestic capital stock and wealth respectively. Output capacity depends positively on the capital stock:

$$Y_f = Y(K) \ . \tag{19}$$

Retaining the assumption that interest rates are fixed at the world level r^*, in the S-I specification the current account, which equals the change in net foreign investment according to the well known accounting identity, becomes:

$$CA = \dot{NFA} = S(r^*, Y(K), W) - I(r^*, K) \tag{20}$$

where national wealth W is defined as net foreign assets NFA plus the domestic capital stock K:

$$W \equiv NFA + K \tag{21}$$

As long as the current account remains in surplus, domestic holdings of net foreign assets will be rising. This accumulation of wealth gradually raises expenditure (i.e., reduces saving) relative to domestic income until current account balance is restored.

Positive investment has three divergent influences on the current account. First, the direct effect of increased investment worsens CA by raising investment relative to saving. Second, capital accumulation increases wealth, thereby leading to reduced saving over time. This effect, however, is tempered by the third, positive effect of rising output capacity on saving (for a given level of wealth). The adjustment process can be characterized by a simple differential equation model:

$$\dot{K} = I(r^*, K) \tag{22}$$

$$\dot{NFA} = S(r^*, Y(K), NFA + K) - I(r^*, K) \quad . \tag{23}$$

Taking a Taylor series expansion arond the long-run equilibrium point (K^*, NFA^*), (22) and (23) can be linearized and written in matrix notation:

$$\begin{pmatrix} \dot{K} \\ \dot{NFA} \end{pmatrix} = \begin{bmatrix} I_k & 0 \\ S_y Y'(K) + S_w - I_k & S_w \end{bmatrix} \begin{pmatrix} K - K^* \\ NFA - NFA^* \end{pmatrix} . \tag{24}$$

The model is stable, implying that the current account attains a long-run level of zero, provided the coefficient matrix:

$$A = \begin{bmatrix} I_k & 0 \\ S_y Y'(K) + S_w - I_k & S_w \end{bmatrix} \tag{25}$$

has a positive determinant and a negative trace:

$$\det A = I_k S_w > 0$$
$$\text{trace } A = I_k + S_w < 0 \quad . \tag{26}$$

These conditions are met under the usual assumptions that $I_k < 0$ and $S_w < 0$. In the foregoing discussion, foreign investment income has been omitted from total income as well as from the current account. In fact, the current account should be defined as $CA = X - M + rNFA$. Presumably national saving should depend not on domestic output but on gross national product, $Y + r^*NFA$, which may exceed or fall short of output depending on the interest receipts/payments on the country's foreign assets/liabilities. The inclusion of foreign investment income is straightforward. Saving equals:

$$S = S(r^*, Y + r^*NFA, K + NFA). \tag{27}$$

The coefficient matrix A becomes:

$$A = \begin{bmatrix} I_k & 0 \\ S_y\, Y'(K) + S_w - I_k & S_w + S_y r^* \end{bmatrix} \tag{28}$$

where:

$$\det A = O_k(S_w + S_y r^*) \gtrless 0$$
$$\text{trace } A = I_k + S_w + S_y r^* \gtrless 0 \tag{29}$$

Because $S_y > 0$, the possibility of instability exists once foreign investment income is included in national income.

4 EMPIRICAL TESTING OF THE SAVING-INVESTMENT APPROACH

According to the saving-investment approach, the current account can be written (in discrete time form) as:

$$CA_t = S_t(r_t, Y_t, W_{t-1}) - I_t(r_t, K_{t-1}) \quad . \tag{30}$$

On the basis of economic theory we expect:

(i) $\partial S/\partial r > 0$, $\partial I/\partial r < 0$ and hence $\partial CA/\partial r > 0$,

(ii) $\partial S/\partial Y > 0$, $\partial S/\partial W < 0$,

(iii) $\partial I/\partial K < 0$.

Several caveats are important. First, since the model can be used for analyzing the long-run current account when output is at its capacity level, the appropriate income variable would appear to be potential GNP. Any empirical application would, however, have to contain a variable to capture cyclical factors as output fluctuated around full capacity. Moreover, if saving is specified to depend on actual rather than full-employment income it is essential to acknowledge the endogeneity of income. At a minimum this suggests the use of two-stage least squares (2SLS) estimation techniques; ideally, the income determination process should be modelled explicitly.

Second, the role of monetary variables in interest rate determination should be addressed; it is unreasonable to assume that world interest rates adjust to equate world saving and investment in the short run--if ever. Extending the model to include monetary variables would, however, probably be less important to the quality of the empirical results than incorporating income determination, as the responsiveness of saving and even aggregate investment to interest rates is often quite small empirically. Nevertheless, financial variables may influence saving and investment indirectly via their effect on current income and expected future income. To obtain an accurate model of income determination, it appears that one cannot avoid specifying export and import equations. With such a specification, the model can be used to obtain both short-run and long-run levels of the current account. The long-run level can be obtained most directly by analyzing the model's saving

and investment equations. When full-employment income and the "normal" level of real interest rates are inserted into the aggregate saving and investment functions, the "structural" or full-employment current account balance CA_f can be determined.[4] Due to cyclical factors, actual current account values in each period should be expected to differ--perhaps by large amounts--from the structural or full-employment level. Consequently, the S-I approach is unlikely to be useful in making short-run economic projections. Since export and import equations are required for income determination, they might just as well be used to forecast the current account directly.

It should be noted that the trend current balance CA_f will not be constant over time but will change (via the international adjustment process described earlier) as net foreign investment affects national wealth and thereby domestic expenditure patterns. Although the wealth effects influence the long-run level of the current account, they may be swamped in the short run by the effect of cyclical variation in GNP around its full-employment potential. Nevertheless complete specification of saving-wealth interaction may be worthwhile: it may alter the dynamic properties and improve the intermediate-run forecasting ability of macro models with important foreign trade sectors, such as the Bank of Canada's RDXF model.

Empirical Results

The saving-investment approach suggests that domestic and foreign interest rates, private wealth, and other variables such as expected inflation may have important influences on the current account. Yet these variables may have been ignored because the focus was directly on export and import equations rather than on the saving and investment equations when movements in the current account were analyzed. Therefore, it is useful to investigate the statistical significance of such variables in aggregate (national) saving and investment equations. Although several estimation techniques, including the seemingly unrelated regressions (SURE) technique, 2SLS and 3SLS were applied, the empirical results differed little from those obtained using OLS. Hence

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4. This concept is analogous to the concept of the full-employment fiscal deficit in the public finance literature.

the regressions reported here will be confined to OLS.

Regressions (1) and (2) are representative of the saving and investment equations that resulted after insignificant variables were eliminated.[5] The data are annual and cover the period 1955-80. All variables are defined in the Appendix.

National Saving (1955-80)

$$\frac{S}{PGNE} = 1728.32 - 759.37\ RL + .16\ UGNE + .28\ (V/PGNE)_{-1}$$
$$\qquad\qquad (2.34)\quad (2.54)\qquad (4.73)\qquad (1.87)$$

$\bar{R}^2 = .986$ S.E.E. = 812.96 D.W. = 1.68

(t-ratios in parentheses)

Real Investment (Fixed Capital Formation and Inventory Accumulation)

$$I = 1357.65 - 1093.76\ RL + 939.25\ RL2 + 470.45\ INF$$
$$\qquad\quad (1.89)\qquad (2.36)\qquad (2.23)\qquad (6.49)$$
$$+ .59\ UGNE - .71\ UGNE_{-1} - .18\ UGNE_{-2} + .14\ UGNE_{-3}$$
$$\qquad (4.57)\qquad (3.63)\qquad (1.77)\qquad (1.67)$$
$$+ .09\ K_{-1} + .61\ I_{-1}$$
$$\qquad (2.39)\qquad (3.09)$$

$\bar{R}^2 = .992$ S.E.E. = 534.10 D.W. = 2.04

(t-ratios in parentheses).

These estimated equations cast doubt on the value of the saving-investment approach to the current account. In the saving equation, the

5. A number of alternative specifications were tried in the saving and investment equations, and both short-term and long-term interest rates in Canada and the U.S. were considered. The inflation rates in these countries were also included, both separately and to convert nominal rates into (ex post) real rates. For both equations, (unconstrained) distributed lags on income were used. Alternative scaling variables for the dependent variables were experimented with. Saving was expressed in nominal terms, in real terms, as a fraction of income, and as a fraction

coefficients on the long-term interest rate (RL) and the lagged net wealth variable ($V/PGNE_{-1}$) have the "wrong" signs (given what would be expected a priori on the basis of the theory). The significant positive effect of wealth on saving is particularly disturbing given the central role of negative wealth effects on saving in shaping the dynamic adjustment path of the current account, according to the S-I model outlined above.

In the large number of quarterly as well as annual saving equations that were estimated, the interest rate variables (domestic, foreign, long-term, or short-term) were typically insignificant. The wealth variable was often insignificant also; when it entered the regression significantly, it more often than not had a positive coefficient. Finally, the (actual) domestic inflation rate on saving proved, in most equations, to have a positive effect.

As for the investment equation, the inflation rate typically had a significant positive effect.[6] Interest rate variables were only marginally significant in most cases; however, the long-term U.S. rate often entered with a significant positive coefficient. As this variable was included to allow for the possibility of foreign financing of domestic investment projects, one would have expected a negative coefficient, but perhaps domestic firms substitute foreign investment projects for domestic ones as foreign interest rates decline relative to domestic rates.

The distributed lag on income contributed significantly to the investment equation in all cases, although the sum of the coefficients was often very close to zero or even slightly negative. Some improvement in the lag profile could undoubtedly have been obtained by imposing an Almon lag structure. This was not done because the present study was primarily concerned with potential influences on the current account other than those that operate via income.

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of net private wealth. Investment was expressed in real (level) terms and as a ratio to the lagged capital stock. Finally, adjustments were made to eliminate serial correlation whenever it appeared to be a problem and liberal experimentation with lagged value of dependent variables was employed.

6. This might be interpreted as the "Tobin effect" (Econometrica 1965) of expected inflation on the steady-state capital stock. This effect, however, should really be tested while holding the real return on capital constant. Replacing nominal interest rates with ex post real rates often affected both the sign and the significance of the associated regression coefficients.

Finally, the lagged capital stock typically had an insignificant coefficient in the investment equation. Like the small wealth effect in the saving equation, this casts doubt on the empirical importance of the types of stock-flow interaction emphasized in the dynamic version of the S-I approach to the current account discussed in Section 3.

As a second example of the types of empirical results obtained, the two following regressions are reported, based on quarterly data 1955Q2 - 1980Q4. Unlike many other saving equations that were estimated, the one below has wealth entering significantly and with the expected negative sign.

National Saving (1955Q2 - 1980Q4)

$$\frac{S}{PGNE} = \underset{(2.77)}{3780.33} - \underset{(3.73)}{617.48}\ RL + \underset{(1.43)}{142.76}\ RL2$$

$$+ \underset{(3.94)}{.17}\ UGNE - \underset{(2.09)}{52.46}\ (V/PGNE)_{-1} + \underset{(2.18)}{68.19}\ INF$$

$$+ \underset{(1.45)}{80.08}\ INF2 + \underset{(2.12)}{4271.76}\ PGNE + \underset{(11.46)}{.68}\ (S/PGNE)_{-1}$$

$\overline{R}^2 = .987$ S.E.E. = 796.17 D.W. = 1.93

(t-ratios in parentheses)

Real Investment (1955Q2 - 1980Q4)

$$I = \underset{(.38)}{-131.06} - \underset{(.16)}{22.80}\ RL - \underset{(1.23)}{87.67}\ RL2 + \underset{(6.48)}{.55}\ UGNE$$

$$- \underset{(5.13)}{.50}\ UGNE_{-1} - \underset{(.06)}{.00}\ K_{-1} + \underset{(2.51)}{69.21}\ INF + \underset{(10.71)}{.79}\ I_{-1}$$

$\overline{R}^2 = .987$ S.E.E. = 666.6 D.W. = 2.39

(t-ratios in parentheses)

In sum, the empirical results indicate that interest rate variables and stock-flow effects (i.e. lagged wealth in the saving equation and the lagged capital stock in the investment equation) are of minor importance in

aggregate national saving and investment equations. The role of income dominates in both equations. Hence there does not appear to be any need to alter the present modelling of the current account in the Bank's RDXF model, which focuses on income and relative price effects on exports and imports and ignores direct interest rate and wealth accumulation effects.

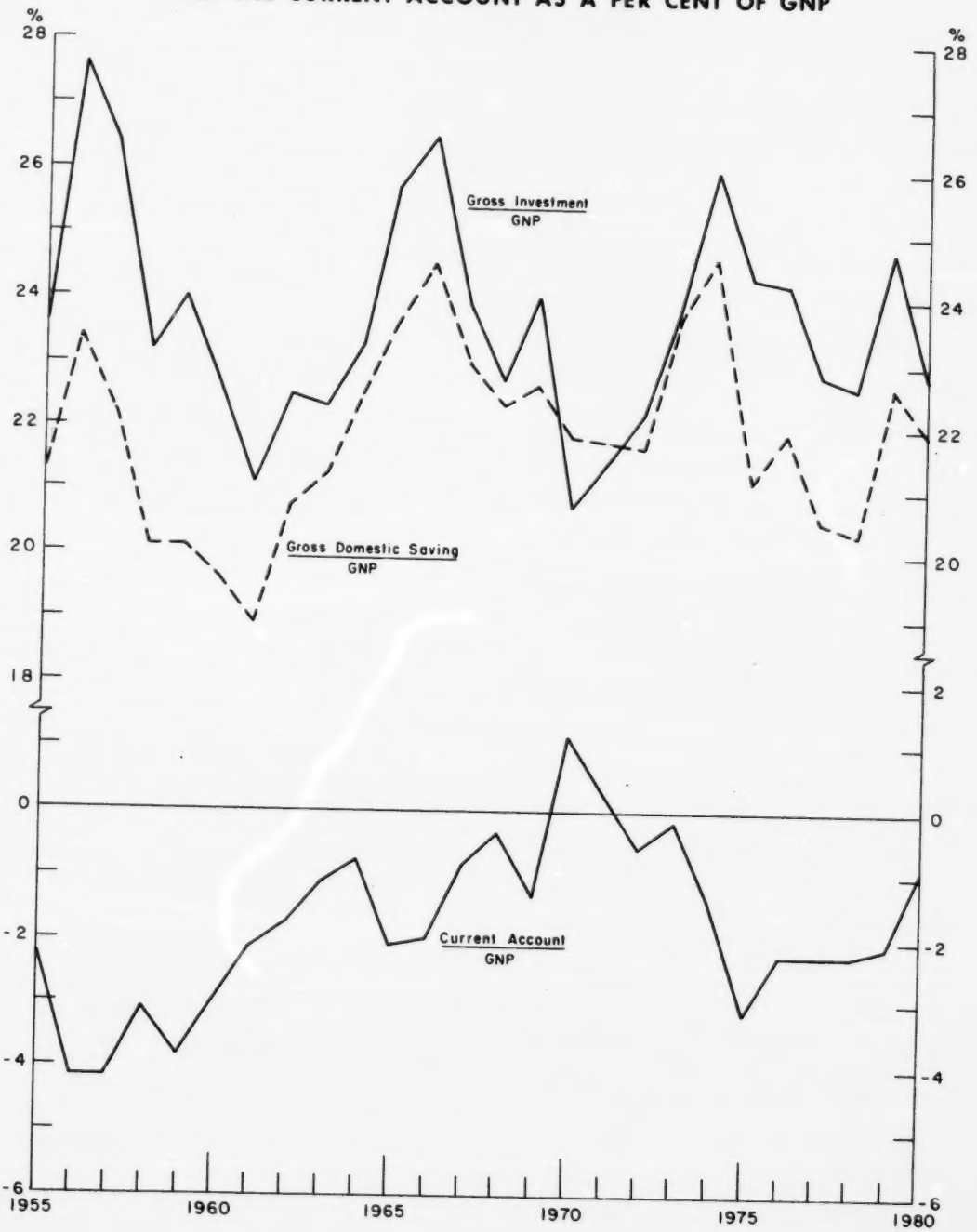
Canadian Trends in Investment, Saving and Current Account Ratios

In spite of the short-run dependence of the current account on cyclical factors, it is sometimes suggested that longer-run trends in the ratio of the current account to GNP can be explained by movements in the gross investment and saving rates. Simple portfolio balance models, for example, stress the interdependence between saving (relative to income) and the current account, but often make the simplifying assumption that investment is zero. On the other hand, recent work by Sachs [1981] attributes most movements in the current account ratios of a large group of countries primarily to changes in their investment ratios over time; saving ratios are thought to be more stable and hence less useful in the analysis.

To evaluate the suggestion that the saving and/or investment rates might be useful in explaining the Canadian current account, Figure 3 is helpful. Several things are strongly reflected in the data. First, the investment rate shows little secular trend; rather its movements are dominated by cyclical considerations with high ratios of investment to GNP corresponding to peaks in the business cycle. Second, the saving and investment rates are positively correlated (as Feldstein and Horioka [1980] have emphasized). Consequently, to determine what happens to the current account, one must compare the relative upward or downward movements in the saving and investment ratios. This is illustrated by comparing the movements of the saving and investment ratios to the movement in the current account ratio.

As can be seen, it is not always true that the Canadian current account ratio mirrors changes in the investment ratio with the saving rate remaining relatively constant, as Sachs [1981] implies is the case for many countries. The subperiod from 1966 to 1975 could, however, be partly characterized that way. The sharp drop in the investment ratio from 26.5 per cent of GNP in 1966

Figure 3
GROSS INVESTMENT, GROSS SAVING
AND THE CURRENT ACCOUNT AS A PER CENT OF GNP



to 23.9 per cent in 1967 and 22.7 per cent in 1968 was reflected in a significant reduction in the current deficit from -2.04 per cent of GNP (1966) to -.75 per cent (1968). A further drop in investment from 24.0 per cent in 1969 to 20.7 per cent in 1970 drove the current account to a 20-year high of +1.29 per cent of GNP. Finally, the strong investment recovery during the 1970-74 resource boom, which preceded an upward movement in the saving ratio, caused the current account to move to a large deficit of 2.88 per cent of GNP by 1975.

On the other hand, both the 1966-75 subperiod and the entire sample period illustrate a positive contemporaneous correlation between the saving and investment ratios. Occasionally the investment ratio leads the saving ratio by one year, a tendency that may be more pronounced in quarterly data. For the most part, however, the annual data indicate that contemporaneous correlation dominates. Consequently it is difficult to substantiate the claims that either the investment ratio or the saving ratio alone typically drives the current account ratio. A more eclectic view, recognizing the differing sources of economic shocks during different historical episodes, is required. The S-I approach does not obviate the need for a more detailed structural model of the current account within the context of a large macroeconomic model.

APPENDIX

DEFINITIONS OF VARIABLES

S — Total gross saving (Cansim D40423).

I — INRC + IME + IIB + IRCA = Real investment (S.A.A.R.) where the component series are from the Bank's model RDXF:

INRC = business investment in non-residential construction.
IME = business investment in machinery and equipment.
IIB = change in non-farm business inventory.
IRCA = investment in residential construction.

RL — Interest rate on 10-year Government of Canada Bonds.

RL2 — Yield on U.S. Treasury securities at constant maturity of 10 years; collapsed to quarterly from average monthly data; obtained from Data Resources Inc. (DRI) U.S. central data bank.

INF — Percentage change in Canadian GNE deflator.

INF2 — Percentage change in U.S. GNE deflator.

UGNE — Gross national expenditure, S.A.A.R., 1971 dollars.

PGNE — Implicit GNE price deflator, seasonally adjusted, 1971=100.

W — Net wealth, current dollars, unadjusted.

K — KNRC + KME + KIB + KRESD = the capital stock, 1971 dollars.

KNRC = stock of non-residential construction, 1971 dollars.
KME = stock of machinery and equipment, 1971 dollars.
KIB = stock of non-farm business inventories, 1971 dollars.
KRESD = stock of houses, single and multiple dwellings, 1971 dollars.

All variables except S, RL2 and I were obtained from the Bank of Canada's RDXF data bank.

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